

CLAIMS

1. A laparoscopic needle delivery device, comprising a generally elongate member, the member having a needle carrying portion for releasably carrying a needle and a loop carrying portion for releasably carrying at least one loop of filamentary material, said loop carrying portion being constructed and arranged to enable said at least one loop to be released from the elongate member whilst still formed as a loop.
2. A device as claimed in claim 1, wherein the filamentary material is suture material and has a more proximal portion and a more distal portion, said elongate member has a hollow central lumen to receive said more proximal portion of said suture material, and said at least one loop is formed in said more distal portion of said suture material.
3. A device as claimed in claim 2, wherein the more distal portion of said suture material extends out of the central lumen at the distal tip of the elongate member.
4. A device as claimed in any one of the preceding claims, wherein the needle carrying portion of the elongate member has a longitudinal axis and the needle carrying portion is constructed and arranged to allow the needle to be carried in an orientation in which the needle is generally aligned with that longitudinal axis.
5. A device as claimed in any one of the preceding claims, wherein the needle carrying portion comprises one or more pre-formed apertures provided in a wall of the elongate member.
6. A device as claimed in any one of the preceding claims, wherein the needle carrying portion of the elongate member includes material which can be penetrated by a needle, enabling the needle to be inserted into said material so as to create a hole in said material thereby to be carried by the elongate member.
7. A device as claimed in any one of the preceding claims, wherein the loop carrying portion is provided to one side of the elongate member so that said at least one loop is wholly positioned to that side of the elongate member.

8. A device as claimed in any one of the preceding claims, wherein the loop carrying portion is arranged to carry said at least one loop alongside the elongate member.
9. A device as claimed in any one of the preceding claims, wherein the elongate member has a longitudinal axis and the loop carrying portion is arranged to carry said at least one loop adjacent to said axis.
10. A device as claimed in claim 9, wherein said carried at least one loop is not coaxial to said longitudinal axis.
11. A device as claimed in any one of the preceding claims, wherein said loop carrying portion comprises a projection under which said at least one loop can be carried to be carried by said elongate member.
12. A combination of:
 - a device as claimed in any one of the preceding claims;
 - said needle; and
 - a length of said filamentary material.
13. A combination as claimed in claim 12, wherein the needle is attached to the distal end of the length of filamentary material, the length of filamentary material has said at least one loop formed therein at a position spaced from said distal end, said at least one loop is engaged with said loop carrying portion so as to be carried thereby and said needle is engaged with said needle carrying portion so as to be carried thereby.
14. A method of using the combination of claim 13 to form a suture, the method comprising releasing the needle from the needle delivery device, passing the needle through the elements to be sutured, passing the needle through the centre of said at least one loop and tensioning said at least one loop to cause said loop to contract to form a knot in the filamentary material.
15. A method as claimed in claim 14, wherein said at least one loop is removed from the loop carrying portion before the needle is passed through the loop's centre.

16. A method as claimed in claim 14, wherein said at least one loop is being carried by the loop carrying portion when the needle is passed through the loop's centre.
17. A method as claimed in any one of claims 14 to 16, wherein the elements to be sutured are intracorporeal.
18. A laparoscopic device for use in ligating a tubular structure, the device comprising an elongate member having a generally hook-shaped distal portion to enable the tubular structure that is to be ligated to be received in said portion, said elongate member further comprising a loop carrying portion for releasably carrying at least one loop of filamentary material, said loop carrying portion being constructed and arranged to enable said at least one loop of material to be released from the elongate member whilst still formed as a loop.
19. A device as claimed in claim 18, wherein the loop carrying portion is provided to one side of the elongate member so that said at least one loop is wholly positioned to that side of the elongate member.
20. A device as claimed in claim 18 or claim 19, wherein the loop carrying portion is arranged to carry said at least one loop alongside the elongate member.
21. A device as claimed in any one of claims 18 to 20, wherein the elongate member has a longitudinal axis and the loop carrying portion is arranged to carry said at least one loop adjacent to said axis.
22. A device as claimed in claim 21, wherein said carried at least one loop is not coaxial to said longitudinal axis.
23. A device as claimed in any one of claims 18 to 22, wherein said loop carrying portion comprises a projection under which said at least one loop can be wedged to be carried by said elongate member.
24. A combination of :
the device of any one of claims 18 to 23; and
a length of said filamentary material.

25. A combination as claimed in claim 24, wherein said length of filamentary material has said at least one loop formed therein and said at least one loop is engaged with said loop carrying portion so as to be carried thereby.

26. A combination as claimed in claim 24 or claim 25, wherein the length of filamentary material is provided with a weight in the region of its distal end and said at least one loop is spaced proximally from said weight.

27. A method of using the combination according to any one of claims 24 to 26 to ligate a tubular structure, the method comprising engaging with said generally hook-shaped distal portion the tubular structure to be ligated, passing the distal end of the filamentary material around the tubular structure and back through the centre of said at least one loop and tensioning said at least one loop to ligate the tubular structure and to form a knot.

28. A method as claimed in claim 27, wherein the tubular structure is intracorporeal.

29. A device or method as claimed in any one of the preceding claims, wherein said at least one loop of filamentary material comprises part of a plurality of adjacent loops formed in said filamentary material.

30. A device or method as claimed in claim 29, wherein said plurality of adjacent loops form the basic structure of a clove hitch knot.

31. A device or method as claimed in claim 29, wherein said plurality of adjacent loops form the basic structure of a surgeon's knot.

32. A device or method as claimed in any one of the preceding claims, wherein said plurality of loops are constructed and arranged so that, when the loops are tensioned, they will contract to form at least one knot in the filamentary material.

33. A device or method as claimed in claim 32, wherein said plurality of loops are constructed and arranged so that, when the loops are tensioned, they will contract to form a double knot.

34. A laparoscopic needle delivery device, comprising a generally elongate member, the member being provided with a loop carrying portion for releasably

carrying at least one loop of filamentary material and a needle carrying portion for releasably carrying a needle in both a longitudinal orientation, in which the needle is generally aligned with the longitudinal axis of the elongate member, and a transverse orientation, in which the needle is generally perpendicular to said longitudinal axis.

35. A device as claimed in claim 34, wherein the loop carrying portion comprises a gripper for gripping the loops.

36. A device as claimed in claim 35, wherein the gripper comprises at least one hinged jaw.

37. A device as claimed in claim 36, wherein the loop carrying portion is provided on said at least one hinged jaw.

38. A device as claimed in any one of claims 34 to 37, wherein the needle carrying portion of the elongate member includes material which can be penetrated by a needle, enabling the needle to be inserted into said material so as to create a hole in said material thereby to be carried by the elongate member.

39. A device as claimed in claim 38, wherein said material comprises a resilient sponge-like material.

40. A device as claimed in any one of claims 34 to 39, wherein the generally elongate member has a curved distal end on which at least one of said loop carrying portion and needle carrying portion is provided.

41. A combination of:
a device as claimed in any one of claims 34 to 40,
said needle; and
a length of said filamentary material.

42. A combination as claimed in claim 41, wherein the needle is attached to the distal end of the length of filamentary material, the length of filamentary material has said at least one loop formed therein at a position spaced from said distal end, said at least one loop is engaged with said loop carrying portion so as to be carried thereby and said needle is engaged with said needle carrying portion so as to be carried thereby.

43. A method of using the combination of claim 41 or claim 42 to form a suture, the method comprising:
- removing said needle from an initial needle position in said needle carrying portion;
 - passing the needle through the structure to be sutured, the centre of said at least one loop, and back into the needle carrying portion to assume a subsequent needle position;
 - releasing said at least one loop from said loop carrying portion to pass down the needle; and
 - tensioning said at least one loop to form and knot the suture.
44. A method as claimed in claim 43, wherein in said initial needle position said needle is in said longitudinal orientation, and in said subsequent needle position said needle is in said transverse orientation.
45. A method as claimed in claim 41 or claim 42, wherein said needle is manipulated relative to said laparoscopic needle delivery device using a gripping tool.
46. A method as claimed in any one of claims 43 to 45, wherein the tubular structure is intracorporeal.
47. A device or method as claimed in any one of claims 34 to 46, wherein said at least one loop of filamentary material comprises part of a plurality of adjacent loops formed in said filamentary material.
48. A device or method as claimed in claim 47, wherein said plurality of adjacent loops form the structure of a clove hitch knot.
49. A device or method as claimed in claim 47, wherein said plurality of adjacent loops form the basic structure of a surgeon's knot.
50. A device or method as claimed in any one of claims 47 to 49, wherein said plurality of loops are constructed and arranged so that, when the loops are tensioned, they will contract to form at least one knot in the filamentary material.
51. A device or method as claimed in claim 50, wherein said plurality of loops are constructed and arranged so that, when the loops are tensioned, they will contract to form a double knot.

52. A method of ligating a tubular structure, the method comprising:
providing a length of filamentary material having at least one loop formed therein spaced proximally from the filamentary material's distal end;
positioning said at least one loop adjacent the tubular structure to be ligated;
passing the distal end of the filamentary material around the tubular structure and then through the centre of said at least one loop; and
tensioning said at least one loop to ligate the tubular structure and to form a knot in the filamentary material.
53. A method as claimed in claim 52, wherein said at least one loop is continuously gripped by a first gripping tool up to and including the step of passing the distal end of the filamentary material through the centre of said at least one loop and is released from said first gripping tool prior to said loop tensioning step.
54. A method as claimed in claim 53, wherein the first gripping tool, after release at said at least one loop, is used to grasp the filamentary material to one side of said at least one loop to enable said at least one loop to be tensioned during said loop tensioning step.
55. A method as claimed in claim 53 or claim 54, wherein the distal end of the filamentary material is passed through the centre of said at least one loop by the action of inserting a second gripping tool through said at least one loop, grasping the distal end of the filamentary material and pulling the distal end of the filamentary material back through said at least one loop.
56. A method as claimed in claim 52, wherein said at least one loop is formed coaxially around an instrument having a gripper at its distal end.
57. A method as claimed in claim 56, wherein the gripper is used to grip the filamentary material between said at least one loop and the filamentary material's distal end so as to enable the distal end of the filamentary material to be positioned on the opposite side of the tubular structure to said at least one loop.
58. A method as claimed in claim 57, wherein the gripper is used to position the distal end of the filamentary material on said opposite side of the tubular structure, the gripper is released from the filamentary material, repositioned on the other side of the structure, and then used to re-grip the distal end region of the filamentary material to

guide the distal end of the filamentary material back through the centre of said at least one loop so as to tension said at least one loop.

59. A method as claimed in any one of claims 56 to 58, wherein said at least one loop is caused to move distally along said instrument towards said gripper after said gripper has been used to re-join the filamentary material.

60. A method as claimed in any one of claims 56 to 59, wherein a proximal end of said length of filamentary material is associated with a sleeve around said gripper, whereby said at least one loop is tensioned by longitudinal relative displacement of said sleeve and said gripper.

61. A method as claimed in any one of claims 52 to 60, wherein the distal end of the filamentary material is provided with a weight.

62. A method of forming an additional knot to secure a prior knot formed in a continuous length of filamentary material, a proximal portion of the filamentary material extending between a generally elongate first instrument and the prior knot and a distal portion of said filamentary material extending between the prior knot and the distal end of the filamentary material, the method comprising:

- a) manipulating the first instrument and a second generally elongate instrument to form a loop in the proximal portion of the filamentary material, with said second generally elongate instrument extending through said loop;
- b) gripping the distal portion of the filamentary material using said second instrument;
- c) withdrawing the second instrument through said loop to draw the distal portion of the filamentary material through said loop; and
- d) tensioning said loop to form said additional knot on top of said prior knot.

63. A method as claimed in claim 62, wherein the step a) involves the following sub-steps:

- e) manipulating the first instrument to form said loop in said proximal portion of the filamentary material; and
- f) extending the second instrument through said loop.

64. A method as claimed in claim 63, wherein formation of said loop is achieved by rotating said first instrument.

65. A method as claimed in claim 63, wherein formation of said loop is formed by a relative longitudinal forward and backward movement of the first and second instruments.

66. A method as claimed in any one of claims 52 to 65, wherein said method is performed intracorporeally.

67. A method as claimed in any one of claims 52 to 65, wherein said method is performed on a structure not involving the human or animal body.